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METHOD OF EDUCATION:

AN ADDRESS

INTRODUCTORY TO THE SESSION 1859-60

OF THE

ST. LOUIS MEDICAL COLLEGE,

BY

J. H. WATTERS, M.D.,

Professor of Physiology and Medical Jurisprudence.

ST. LOUIS:

GEORGE KNAPP & CO., PRINTERS.

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1859.

St. Louis Medical College,
November 1st, 1859.

Prof. J. H. Watters.

Dear Sir,

At a meeting held by the Class, J. T. Marsh in the chair, it was unanimously resolved, that a committee be appointed for the purpose of requesting from you permission to publish your Introductory Address, delivered before the Class, in College Hall, on the evening of October 31st. Hoping that the above resolve may receive your approbation, a favorable reply will meet with the thanks of the Class, and of yours,

Respectfully,

J. L. WILCOX.
GRATZ A. MOSES.
CHAS. KNOWER.
JOHN THOMPSON
J. C. HICKERSON

St. Louis, Nov. 2, 1859.

Dear Sirs,

The manuscript of my lecture is at your service; please present to the Class my acknowledgment of the compliment,

And believe me, as ever,

Your attached friend,

J. H. WATTERS.

To Messrs. Wilcox, Moses, Knower, Thompson, Hickerson.

METHOD OF EDUCATION:

An Address Introductory to the Session 1859-60 of the St. Louis Medical College. By J. H. WATTERS, M.D., Professor of Physiology and Medical Jurisprudence.

GENTLEMEN,—Under favorable auspices we meet to-night to celebrate the opening of our eighteenth session, and in behalf of the faculty I welcome you as students to these halls dedicated to medical education.

The ardent aspirations of the young of a country to fit themselves for useful and honorable activities, brings happiness not only to the individual, but secures life, intelligence and refinement to society—stability, power and influence to the state. It is this which engenders and fosters the very vitality, spirit and soul of a community. General society—yes, our whole country—is interested in this assemblage of young men gathered hither from the various parts of our extensive and prosperous valley, all inspired with a common desire to be enabled to render a reasonable answer to the problem of life. Some answer, whether it be reasonable or not, must be given by every man. It is not optional, but the necessity is implied in the very existence of a rational being: it is not a request, but an imperative demand. Should one think to avoid it by silence or refusal to act, he deceives himself; for his very silence and supineness become contempt, and contain already his answer.

Man is by nature most munificently gifted; but his character and activities are the answer he renders to the question, "what will he do with it"—with his life, his mind, his reason, his image of God? The various grades of characters, from the lowest besotted dregs of society to the highest and noblest men, present merely the different uses made of nature's high gifts. Consider now

> "The wisest of the sages of the earth
> That ever from the stores of reason drew
> Science, and truth, and virtue's dreadless tone;"

and now reflect upon this solemn fact, that

> "Him, every slave now dragging through the filth
> Of some corrupted city his sad life,
> Pining with famine, swoln with luxury,
> Blunting the keenness of his spiritual sense
> With narrow schemings and unworthy cares,
> Or, madly rushing through all violent crime,
> To move the deep stagnation of his soul,—
> Might imitate and equal."

We hear in our youth too much cant about "poor weak human nature, the flesh, and the devil;" and those who would throw upon the shoulders of these imaginary personalities the necessary and legitimate results of individual slothfulness, inactivity, and refusal to use what has been given, would obliterate what little of the image of God is yet visible in humanity, and would put a stop to progress—not by bold and open opposition, which would be accompanied with corresponding reaction, but by smothering and destroying the already enfeebled energy and spirit.

That each individual may use his talents and powers in the best and most reasonable way possible, is the object of all education, whether literary, professional, scientific, or religious. In other words, the object of education is to enable man, in his activities, to harmonize with the Infinite, the Universal, the Absolute. It is only as his activities do harmonize and thus coöperate with the Infinite, that man is emancipated and exalted; while in so far as they are discordant, man militates against God, and in the conflict is always vanquished, degraded and enslaved. This proposition is universal, and extends in its application through the whole range of human activities. And, gentlemen, as you propose to assume the responsible vocation of physicians, the object of your professional studies is that you may be enabled so to act upon physical nature as to cure disease and relieve suffering. This, too, can be done only by coöperating with the universal and absolute in perfect obedience to the physical laws; which laws are to us the outward expression or representation, in space and time, of universal reason. If our acts are not in obedience to these laws, our medications, like the prayers of the wicked, are an abomination. It is a common saying that nature cures disease, and that the physician's province is to assist nature. While this expression admits of very liberal interpretations, yet literally it is most false. Man under no circumstances assists nature; this is neither his province nor prerogative: it is *his* highest privilege to *use* nature. But how are we to use nature? By what method are we enabled

to take advantage of her laws? In other words, what relation has education to success, science to art? This is the question I propose discussing to-night; and while I address you, gentlemen, especially, as medical students, the method by which you will be enabled to attain the objects of your calling, is *the method* of every human activity whatever—of your social and political relations no less than professional.

As the object of all education is to enable man to harmonize his activities with the Infinite, the Universal, the Absolute, this object can be attained only so far as we know the Infinite, the Universal, the Absolute. I am aware that there are those high in authority who contend that the capacity for this knowledge is not vouchsafed to man. If this be so, then indeed are we most miserably circumstanced. What! here—possessing hopes, desires, aspirations, longings for something better—condemned to disappointment and ignoble defeat upon every side, except in so far as our activities are in harmony with the Infinite, and yet having no capacity to know that Infinite by whom we are judged and to whom we are subject! This can not be so: else man could not adapt means to ends; the result of his spontaneity would be altogether accidental; his fortune would not be in his own hands. It is not so: the development of science condemns it; our railroads, telegraphs, and manufactures, and all the arts, condemn it; our social, political and religious relations condemn it; all culture and progress condemn it. As the result of every human activity is determined by its relation to the Infinite, the relation which any people bear to the Infinite is expressed not only in their moral, social, political and religious condition, but also as well in their machinery, their manufactures, their agriculture, their navigation, their architecture, their painting, their sculpture, their poetry, their ornaments, their dress, in all their activities and in every expression of their spontaneity. All advancement and progress of the individual, of society, of humanity, is proof that we have the faculty to know the Absolute to which we are subject, as all success is but an expression of this knowledge, and a resulting harmony between our activities and the Infinite.

But man is guided in his activities by his intelligence, and mind is in its very nature active, spontaneous, self-determinate. Knowledge, therefore, must be the determination of the mind itself, else the spontaneity and self-determination of mind would be superseded and abrogated by knowledge, which is absurd. Consequently, the mind must possess the faculty of determining itself harmoniously with the Universal and Absolute;—whether you agree to

designate this power of the mind thus to determine itself, as knowledge of the Universal and Absolute, or not, matters nothing, so far as the question under discussion is concerned—By what method is man enabled to harmonize his activities with the Infinite, the Universal, the Absolute? *This faculty is reason.* Reason being one and absolute to man, to nature, and to God, it is most apparent, that, so far as our activities harmonize with reason, they must in that very fact harmonize with the Universe and with God. Therefore, the method by which the object of all education is to be attained, is the method by which we are enabled to harmonize our activities with *Reason.* This proposition, gentlemen, embodies the central idea which I hope to present to you to-night in an intelligible manner. You will observe the important point, that in this proposition we have substituted *Reason* for the Infinite, the Universal, the Absolute. I know full well, that, in making this substitution here in a public lecture, I am in no little danger of being understood as making man equal with God. But if there were no danger here, there would be little or no occasion for this lecture; and if, on account of this danger, I had chosen another theme, or had treated this in a manner to conform to the more general and popular notions, I would in that have been hugging my own shackles; whereas my theme this night is, How are we freed, emancipated, exalted? A just man has not his freedom curtailed by just laws in so far as he cognizes justice, because the law unto himself frees him from the external laws; that is, the external laws cease to bind and restrain him just in so far as from his own self-determination he would fulfil them. Just so, and for the same reason, a reasonable man has not his freedom annulled by the laws of reason in so far as he knows reason. As one in his own spontaneity determines himself according to reason, he ceases to be restrained by the external laws of reason. If all moral and physical laws be laws of reason, then indeed can man be delivered from the dominion of necessity only so far as reason in him becomes self-conscious. We believe in Divine Omnipotence; that in the Infinite "we live, and move, and have our being;" that without Him we can not think a good thought or do a good act; and yet we believe that man is free and justly accountable. The truth and consistency of these two positions is all I contend for in the substitution I have made of Reason for the Infinite, the Absolute, the Universal. He who believes in human freedom can not but believe that man possesses the faculty of determining *himself* in harmony with the Universal; for in so far as man is determined by anywhat not himself, he is necessitated and not free. He who

believes in human freedom and also in Divine Omnipotence and Omniscience, must believe these two positions consistent; unless, indeed, he be himself a slave, clinging in blind fanaticism to the very chains which bind him. And what does he mean by consistency except their mutual harmony with reason? And when he acknowledges that two truths *must* be consistent, in this necessity he recognizes reason as the universal umpire, authoritative to man, to nature, and to God.

If, therefore, the object of all education is to enable us to harmonize our activities with reason, then the method we seek is the method of reason becoming self-conscious, or, in other words, it is the method of reason coming to a knowledge of itself. This is perfectly clear, that in order that we may harmonize our activities with reason we *must* know reason. But the reason alone can know reason; consequently we can know reason only as the reason becomes self-conscious. Did you ever see a little child held before a looking-glass? Through its senses it cognizes the phenomenon and through its understanding it is convinced of duality,—it peeps behind the glass fully expecting to find another child. But as it comes to know itself, with apparent rapture it recognizes itself in the image. Not the senses, nor yet the understanding, but only reason can know and comprehend reason. The spontaneity of man may be under the dominion of the senses, or of the understanding, or of the passions; but as these are all finite and related to the infinite only in and through reason, when they guide, the blind lead the blind and both fall into the ditch together. But when our spontaneity is guided by reason, the outward expressions of this spontaneity—our activities, our works—must harmonize with reason, with nature, and with God. The great problem of humanity, therefore, is to identify our spontaneity in each, every and all of its various possibilities with self-conscious reason. Our question, therefore, as to the method by which the object of education is to be attained is now reduced to this form: What is the method of the reason in becoming self-conscious?

As we are students of nature, and as in this department especially we hope to assist in the great struggle of humanity, and to leave the world the better of our having lived, (if this be not our ambition we are unworthy of humanity,) I shall seek this method only as expressed in the more developed sciences. And we may hope to get some insight thus, because Science is the formal recognition of reason. Do not allow yourselves to anticipate me here, and to object in your thoughts to this position, that the physical sciences treat of nature and her laws, and, consequently, that a knowledge

of these laws can be obtained only through observation and experiment. Be patient one moment and we will consider this matter together. It is admitted that observation and experiment are necessary *conditions* to a knowledge of nature and her laws, but you must admit also that you neither see, feel, taste, nor smell the physical sciences. It is true you put ores and compounds into the crucible, but you neither put therein nor take hence the science of chemistry; it is true certain angles and distances must be obtained by observation, but the transit instrument and the telescope are not wonderfully devised machines for the manufacture of the *science* of astronomy; you may examine and peep, but the science is not there—you can not get it thus. What, then, is the relation between observation and science? This question is *sub judice*, and until decided it might be well to suspend our anticipated objection. Physical science is rendered possible only in and through the identity of the laws of nature and the laws of thought. This is a self-evident proposition; for if nature could in her mode of action be whimsical or unreasonable, where, I ask, would be the criterion whereby we could know nature or determine her mode of action? There would be none, and we would necessarily be utterly in the dark. If there be physical science at all, therefore, the laws of nature must be identical with the laws of thought, and Science must be the recognized identity. The senses do not and can not give us science; observation and experiment can only give phenomena. Physical science exists only so far as reason has come to a recognition of itself in the phenomenal. That is, so far as we have science reason must have become the criterion whereby nature is recognized as laws of thought. But reason can become the criterion only in so far as it becomes self-conscious, or as it knows itself. Consequently, we may hope by an examination and careful analysis of the sciences, to learn something of the method whereby the object of all education is to be attained; in other words, of the method of reason in becoming self-conscious or in recognizing itself. Though we may thus only obtain a partial insight, yet even this is not to be altogether despised.

As mathematics is more developed and more generally understood than any other science, we will direct our attention to it especially. And let it be understood that our object here is not to reduce all science to what has been termed the mathematical method, but rather to seek in the mathematics the method of the reason in becoming self-conscious, as all science (mathematics, of course, included) has been shown to be the reason coming to know and recognize itself. As my object, as a teacher, is always more to

excite thought than to amuse,—to draw out the mind rather than to instil dogmas, I hope you will excuse me for selecting for your consideration a subject requiring so much study. My excuse is that the principles involved in this subject, though they may seem abstract, are most practical, forming as they do the very foundation of all knowledge and all success.

Mathematics as a science starts with certain primary propositions, which are divided usually into two classes—Definitions and Axioms. But what mean these propositions? whence came they, and where is the authority for the use made of them in mathematics? If we can obtain correct answers to these questions, we will have approached very near what we seek: but do not be uneasy, I do not intend to lead you over the paths already well worn by the Sensationalists and Idealists. First let me call your attention to this most important consideration—*That there can be no existence, law, mode of action, or phenomenon, without limitations;* for all these imply determinations, and there can be no determinations without limitations. This is self-evident and absolute; think of it one moment. There can be no *this* and *that* without a difference, and there can be no difference without limitations. To vision, pure light would be equivalent to pure darkness; there can be no seeing without a mingling of the two—without shades or colors. Power is equivalent to no power without resistance; you can not lift yourself by the hair; as Archimedes could not find a *pou stō*, or place to fix his machine, he could not move the earth. The equation sign stands forever between absolute motion and no motion; the ancients did not recognize the parallel lines, and they attached the predicate *no motion* to the earth. And our physical sciences (so called) now are mostly legerdemain to induce the student, by complicating the process, to believe he has succeeded in lifting himself; in lieu of the earth, physical science is placed on the back of a tortoise. As there could be nothing to know, therefore, without limitations, so there could be no knowing. As all things and phenomena depend upon the union of opposites, as of motion and rest, of power and resistance, of light and darkness; so science is based upon the union of opposites necessarily. As what is to be known has its existence in this union, evidently the knowing must be based upon it. Now pure space, like pure light, is without limits, and consequently is without determination. There is no *this*, as determined from *that;* there is no *here* and no *there;* no outside and no inside; no circumference, and no centre. As, for vision pure light must be united with its opposite—darkness, so the science of geometry must be based upon the union of the pure idea space

and its opposite. Now, what stands opposed to space as darkness is opposed to light? You at once recognize it as the *point*. The point is not space, but it is related to space as its opposite, as its negation, as its limitation. We are now prepared to understand the meaning of the Definitions upon which geometry is based. These definitions are the limitations of space by its opposite—the point;—the motion of a point may be said to generate a line; the motion of a line, to generate a surface; the motion of a surface, to generate a solid. So, while pure space is without limitations or determinations, yet united with its opposite we have definitions as the bases of science. We now have a *here* and a *there*, a *this* and a *that*. By this union we have a straight line, a curved line, a triangle, a square, a polygon, a circle, an ellipse, a parabola, an hyperbola, a polyedron, a prism, a parallelopipedon, a sphere, an ellipsoid, &c. &c.

But before investigating further the meaning of the definitions of mathematics, we must investigate whence they came; a knowledge of their origin will contribute to the understanding of their nature. You are aware that many contend that all our knowledge, including of course mathematical definitions and axioms, is derived from sensation; and that others contend, no less confidently, for the existence of innate ideas, and for this origin of all knowledge. It is not pertinent to our present object to meddle with either of these systems. We have seen that all determination is through limitation; that is, if all limitation were removed from any thing, all determination would be removed; and what would be left would be equivalent to nought—is *nothing*—the thing would no longer have existence. But do you say something would still be left? Think one moment; your something left being without determinations, wherein, I ask, is its difference from nothing? You call it something, I call it nothing, and you can not apply a predicate to your something which I can not also apply to my nothing; if you can, then your "something left" has limitations, which is contrary to the hypothesis. It is perfectly apparent, therefore, if we know not the limitations, we know not the thing; and that, in so far as we know the limitations, we know the thing in itself—the thing having an existence only in these limitations. Therefore, if things in themselves were not related to us, we could never know them; if there were no bond of union between nature and ourselves, all things in nature by which we are surrounded would be to us as though they were not,—we would be unconscious of their existence. Consequently, if we know nature at all, (and no one will be likely to deny this,) there must be some means

of our knowing or becoming conscious of the limitations of things in themselves. But how can the mind know or become conscious of that which is outside of itself? This is the difficult but most important question. If we admit the duality of nature and mind, must we admit that the mind can get outside of itself to know nature? This would be a manifest absurdity, for nothing can get outside of itself. Then, to admit a knowledge of nature, are we compelled to do away with the duality, and to become out and out materialists on the one hand, or idealists on the other? I think not. Then, if the mind can not get out of itself, how can the mind know nature if duality be admitted? I think I see one, and only one possible solution of this problem; for, in admitting that the mind can not get out of itself, we admit that our knowledge of nature comes from the mind knowing itself. This is the problem: Admitting the duality of nature and mind, and that the mind can not get out of itself, how can the mind know nature?

It is admitted that we have some knowledge of nature, and, consequently, that there must be some relation between mind and the external world. Now if we admit duality, the only possible relation is that of mutual limitation; that is, in so far as nature and mind are distinct and dual, they must reciprocally exclude and negate each other. And in so far as they are distinct, the only possible relation they can have on the side of their duality must be the mutual limitation through this reciprocal exclusion and negation. This is the only possible relation upon the admission of duality, because neither could get outside of itself, which would of course be necessary for any other relation. Consequently, this relation, so far from requiring the denial, is *in virtue* of the duality; and, as this is the only possible relation consistent with duality, this must be the avenue to a knowledge of nature; or else, we must deny either the duality, or, the possibility of such knowledge. These three are the only possible alternatives:—You must either do away with the duality and become materialists on the one side, or idealists on the other; or else, admitting the duality, you must deny the possibility of a knowledge of nature; or else, admitting both the duality and a possibility of a knowledge of nature, you must find in the mutual exclusion and limitation the condition of this knowledge. Endorsing this last alternative, we must endeavor to see how nature and mind mutually excluding and limiting each other, is the avenue to a knowledge of nature. We are not now concerned with the inquiry *how* nature and mind limit each other, but our present inquiry starts with the fact that they *must* limit each other, upon the admission of duality. This is the solution: Nature and

mind mutually excluding and limiting each other, *in so far as the mind cognizes its own limitation, in that act, being limited by nature, it recognizes the limitation of nature.* To illustrate: suppose A and B own adjacent farms; A, in knowing the limitations of his, knows, in that very fact, the limitations of B's so far as they mutually limit each other; just so, the mind, in knowing its own limitations, knows the limitations of nature so far as they exclude and limit each other. Thus the mind knows nature in knowing itself. This is the only possible solution; but we need no other as this is in every respect most satisfactory, containing within itself evidence of its truth, and is therefore worthy of all acceptation, even though we were not *forced* to adopt *it*, or else either materialism or idealism, or the doctrine that all knowledge of nature is impossible. But, at first glance, all this may seem to have little to do with the Definitions of mathematics. Upon reflection, however, I suspect it will be found to have somewhat to do not only with mathematics but with our political, social and even religious condition, with the steam engine and weaver's shuttle and doctor's pill, and even with our bread and butter.

But to continue;—all knowledge, therefore, including mathematics and the natural sciences, is the mind knowing itself. If this be so, you may ask, how do we know that nature is actual and real? You may say, "upon the admission of the duality of nature and mind, and, that they mutually limit each other, it is clear enough that the mind, in knowing itself, knows nature in so far as they thus limit each other; but, if the mind only knows itself, how do you get the duality? How does the mind know that an actual nature stands over against it limiting it; and that these limitations of itself, which only it knows, have an external condition at all?" This knowledge comes through sensation, which gives us a consciousness of objectivity. This will be clear, I think, if you will call to mind a point already discussed at some length. As we have seen that all existence and phenomena depend upon the union of opposites, as of motion and rest, of power and resistance, of light and darkness, so all consciousness implies duality. Consequently, consciousness in the line of our spontaneity—that is, a limitation where we *know* there is no internal limitation—gives us objectivity authoritatively. The primary condition of our knowledge of the existence of nature, as opposed to and as limiting mind, is motion. But I must not dwell upon this part of my subject.

On the other hand again, one disposed to sensationalism will object,—"this is all nonsense to talk about the mind knowing nature by knowing itself,—I see and feel objects themselves, but I do not

know the mind,—I can not see it!" I grant you your position fully—that you see and feel objects, and that you know mind very little; probably if you could only get it under a microscope, or into a crucible, you would know it better. But I thank you for your objection just here in close juxtaposition with the one of the idealist already considered; as we have to steer here between Scylla and Charybdis, we must keep in mind their localities. In reply to idealism just now, it was maintained that objectivity is given authoritatively in sensation, in that all consciousness implies duality,—the union of opposites. This seems to the senses to approach dangerously close to you, O voracious Charybdis! who would draw all knowledge into the abyss of sensationalism. You say you do not know mind, but that you know nature, objects, matter, which are given in sensation. Hence you peep at nature; you make observations and experiments; you turn her round to make her present herself to your senses on as many sides as possible; probably you may use a microscope to assist the senses; you note down very carefully the results—what you see; you classify this and call it *Physical Science!* And to be so lucky as to see something first, say a new fossil, and to describe it and classify it, entitles one to endless fame in the history of *Science!* Can it be that now, in the latter half of the nineteenth century, such a gross and bungling counterfeit is palmed upon humanity so currently! You say you know little or nothing of mind because you can not see it,—this I have granted without the slightest mental reservation; but you say you know nature and objects around you *because* you see them and feel them! Hold! you feel the fire and say it is hot; you see the rose and say it is red; you taste sugar and say it is sweet. But the sugar is not sweet, the rose is not red, the fire is not hot; these are but sensations which you objectify and put into things which you say you know in sensation. Now you must acknowledge that you know not the things you imagine you see, and you say that you know not mind as you can not see it;—what, then, do you know? Your physical science is no science, containing as it does the two factors—the things seen and the individual seeing—most heterogeneously mixed up, neither known, both undetermined, and one of them (the individual seeing) extremely variable. Call this *Science!* It is mockery, it is trifling with common sense to palm such stuff off as science.

We have seen that the mind can know nature only in knowing itself, and, consequently, that the mind can know nature only in so far as they mutually limit each other. Now the grossest sensationalist acts upon this position; for when he says the rose is red,

that sugar is sweet, that fire is hot, he actually makes his own limitations in sensation the limitations of things; and the more refined of the class who say, "we can know nothing of nature except the phenomena," in this fully endorse the same position. The real difference between these and me is not here therefore, but rather in this, that they would restrict *mind* to sensation, or at most to the understanding. They, no less than I, acknowledge their own limitations as all they know of nature or indeed can know. But it may be asked,—"if the limitations of mind are the means of our knowing things, or all of nature that we can know, are we not right in objectifying our sensations?" Certainly we are right; if we wished to, we could not help seeing the rose as red, feeling the fire as hot, and tasting sugar as sweet. But I do most solemnly protest against the currency of this, or of any classification or generalization of what is given in sensation, *as science* either of nature or mind. *It is not science, because the mind does not know and recognize itself in what is given in sensation.* It cognizes only the sensation, the feeling, the redness, the heat, the sweetness, &c., which are cognized as well by beasts; for no doubt they see the grass as green and feel the fire as hot as well as we. In the language of Scripture,—"The ox knoweth his owner, and the ass his master's crib; but Israel doth not know, my people doth not consider." The mere cognition of phenomena is not knowledge either of the thing or of mind; and although phenomena are an essential condition of physical science, it is a gross blunder to suppose we can get knowledge or science by an accumulation, classification, and generalization of *no*-knowledge, *no*-science. You can not hang your coat on the shadow of a nail; it will not sustain it, try it as often as you please. From all we have said, it follows most manifestly that, as the thing exists only in its limitations as we have seen, and as the limitations of nature are the limitations of reason, physical science can only exist in this,—*the reason becoming self-conscious and recognizing itself in what is given in sensation.* This is a most difficult process, but it alone is worthy of humanity and of our highest ambition; the reason in becoming self-conscious pulls down the "wall of partition," and admits us into the very presence of the Infinite, the Universal, the Absolute. It alone can make us free indeed, not by doing away with the external law, but by enabling us in our own spontaneity to fulfil the law; which is the object of all education, and should be of all human aspiration.

But, as we have seen, the mind can not get out of itself, and yet, what has been given in sensation you have thrown from you and already put in the thing, or rather, have made it the thing. How

are you to get it back into mind again, to enable the reason to recognize itself in it? It is absolutely necessary, as you see, to get in terms of the reasoning the limitations given first in sensation. The only possibility left now for science, is for the reason to go out and limit itself by the limitations of sense made *object*. To illustrate: suppose you wish to get a cast containing the limitations or form of a given object; you first take an impression in plaster; you now make it the object of which you take an impression in a given metal; you now have in metal the limitations of the original object. So you first take an impression of nature in the terms of external sense, you now make this the object and take an impression of it in terms of the reason. You now have, not science, but the first condition of science; you have the object in terms of the reason,—but the science is the reason coming to know and recognize itself in this its own object. As the thing in itself exists in those same limitations which you now have in terms of the reason, the reason in knowing itself in its own object, knows the thing in itself. The object of reason thus obtained is always an idea limited by its opposite,—as we have already seen the "definitions" upon which geometry is based consist of the idea Space limited by its opposite. Now we see whence the definitions come, and understand clearly what they are. We now have some insight, I think, back to where science must begin, if it begin at all. The definitions upon which geometry is based, are, in distinction from the objects of sense, objects of reason: they are ideal, not sensual. The words, point, line, triangle, &c., are but signs to represent to the understanding the limitations of the idea; consequently, when I say a triangle is a figure bounded by three straight lines, I give only a verbal definition of the word triangle; but the word defined is only a sign of the Conception. So when I draw a triangle on the blackboard, the diagram is only a sensual representation. The real, which the verbal definition and diagram represent, is the ideal object—the object of reason. There are many who think they study mathematics, who never grasp the real definitions, but only the shadow as given in sensations. All these ever reach are forms and rules. When they get a little older and dabble in philosophy, they tell us mathematics is based upon hypotheses and even absurdities; for, say they, "*nothing* can have position which has neither length, breadth, nor thickness, as the the mathematician predicates of a *point*." This only shows that the objector himself does not see the point, and it is to be feared he never will see it, because not given in sensation.

The science of mathematics, in all its various branches, from the determining the product of two and two, to the highest achieve-

ments of Newton or LaPlace, is constituted of the expressions of the reason in the act of coming to know itself in the various limitations of the idea *Quantity*. This definition follows from what has already been sufficiently insisted upon, but I will try to make it even more clear. The data of every mathematical problem must limit the problem, or it can not be solved. This involves, if clearly understood, the most that I have said to-night. Every standard measure of real things must be given both in sensation and in reason; that is, it must be both cognized in sensation and recognized by the reason. For instance, when I say a foot is one straight line twelve inches long, here the *straight line* and numbers *one* and *twelve* are recognized limitations of reason, whereas *foot* and *inch* are cognized limitations of objects. All the standard measures are such as as are both cognized and recognized together, and hence used with the least possible effort. But all which is necessary is that the data should limit both the thing and the idea. Hence, on the side of sensation I may use inch, foot, yard, pole, or any standard, provided I cognize it; so on the side of reason I am not restricted to straight line, but may use triangle, square, circle, &c., &c., provided they can be both cognized and recognized. Hence you see the application of the whole of mathematics to physical science in regard to its *quantitative* determinations. Though I can not measure the height of a steeple with a straight line, a foot stick, I can measure it with a triangle. Here the cognition and recognition are not together, and apparently in the same act of mind, as when a foot rule is used, since we can not recognize the triangle in all its properties by a simple act of the reason. Hence, when we get the base line, or one side of the triangle, in units of feet, and the angles in units of degrees—all of which are both cognized and recognized—we neglect for a time the side of sensation, that the reason may recognize itself in the triangle; and when we thus recognize the other leg of the triangle in units—terms of the reason—we then put back these units into feet from which we took them, and now both cognize and recognize the height of the steeple at once; that is, we know it. This is an illustration of every application of mathematics to physical science.

But the different sciences may involve different ideas; quantity is not the only idea involved in the physical sciences. The ancient Greeks did not, for obvious reasons, succeed in developing a science of other ideas as they did of the idea quantity, and with us other ideas have but little to do with assumed knowledge, with science. We do not recognize the Platonic "Idea" as the very life of all science, of all knowledge and all success; and it is

fashionable in these days to declare, both implicitly and explicitly, that the Organon of Bacon has superseded the Organon of Aristotle. As both sensation and reason are essential to physical science—the one to give the condition, the other the essence and life—it is difficult to comprehend how the one can supersede the other, except upon the assumption that reason is nonessential to science. But if, as we have seen, science consists in the reason knowing and recognizing itself, then this judgment can be but a sign of ourselves, that sense has superseded reason in us;—

> "Doth the harmony
> In the sweet lute-strings belong
> To the purchaser, who, dull of ear, doth keep
> The instrument? True, she hath bought the right
> To strike it into fragments,—yet no art
> To wake its silvery tones, and melt with bliss
> Of thrilling song! Truth to the wise exists,
> And beauty for the feeling heart."

I now find that many points are left untouched which I intended to discuss, and which would be necessary to give unity to the subject; but I find time will not permit, and I must hasten to a conclusion. Let me remark, however, that Axioms are but expressions in terms of the understanding of the *living-force* of the reason of each individual. How erroneous, therefore, is the definition that an axiom is that which all men receive as absolutely true. An axiom is an absolute and universal truth, but it may not be recognized by all men. If I had sufficient energy of thought or living force of self-conscious reason, the proposition that the square of the hypothenuse is equal to the sum of the squares of the other two sides of a right-angled triangle, would become an axiom; but as I have not this, and as the mind can not transcend itself, I have to use the lever of method. But as all this is but the carrying out of what has already been said, I need not dwell upon it. This living energy of reason was so great in Plato, Shakspeare, and Goëthe, that they could lift greater weights directly than most men could with all the appliances of levers and pullies.

We have seen that, as the mind can not get out of itself, (and this position is *im*plicitly admitted by all, though it may be *ex*plicitly denied,) it can know only through a knowledge of itself. We have seen that we can know physical nature even, only because nature exists in its limitations, and these limitations are identical with the limitations of mind or the laws of thought. And God being Infinite Mind, in whose image we are created, the mind knows God only in so far as it becomes self-conscious or knows itself. "God

is a Spirit, and they who worship Him must worship Him in spirit and in truth." But we have seen, also, that the mind can know itself only in self-conscious reason, and that reason hence is the only criterion of truth. It is sad to reflect how little self-conscious reason there is in the world, in humanity. Though reason is the only criterion of truth, and it alone can exalt us and free us, by enabling us to unite and coöperate with the Universal and Absolute, yet, do we not see this our only hope condemned and upbraided even in the pulpit, driven from the state, and trampled down and spit upon by politics, and treated little better by science, so-called? When this is gone, what have we left? Nothing but individual tape-strings! Oh, yes! they all talk loudly about the "Higher Law," and say "do right! do right!" And you ask them, what is the Higher Law? what is right?—and they immediately and with the most impudent assurance present their individual tape-strings, and commence straightway measuring! measuring! But by what authority are these stamped? By the senses, the feelings, the passions. But each individual has a different standard stamped by the same authority, except where what is called education induces many to use the same string. And what power is umpire in these irrepressible conflicts thus inevitably induced? God is out of the question, as reason has been dethroned, and nothing is left but physical force. Hence family, political and religious discord and strife—one tape-string in conflict with another; no self-conscious reason, no knowledge of the Absolute. If you direct your mind through the whole range of human activities, you find *labels* according to these tape-strings stuck on every thing—the most sacred no less than secular. And this is called Knowledge! Truth! Higher Law! And Education, in all its various departments, is, in the main, the drilling into the young these lifeless forms, these shams, these midnight apparitions, these *labels* arranged in order to suit the easy method of the sensational understanding. Oh! it is sad to behold how grossly humanity is engulfed into the senses. We boast that we are the lords of creation; which means, that we can bridle the horse, and that we will ultimately exterminate the lion: for, the spirit of humanity is indicated, not in the question, how shall we use those gifts to us which have not been vouchsafed to beasts? but rather, how shall we make up our deficit in beastly gifts?—"What shall we eat? what shall we drink? and wherewithal shall we be clothed?"

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